Section 6 - Cine Disk Subsystem

This section describes the Cine Disk Subsystem. It is organized as follows:

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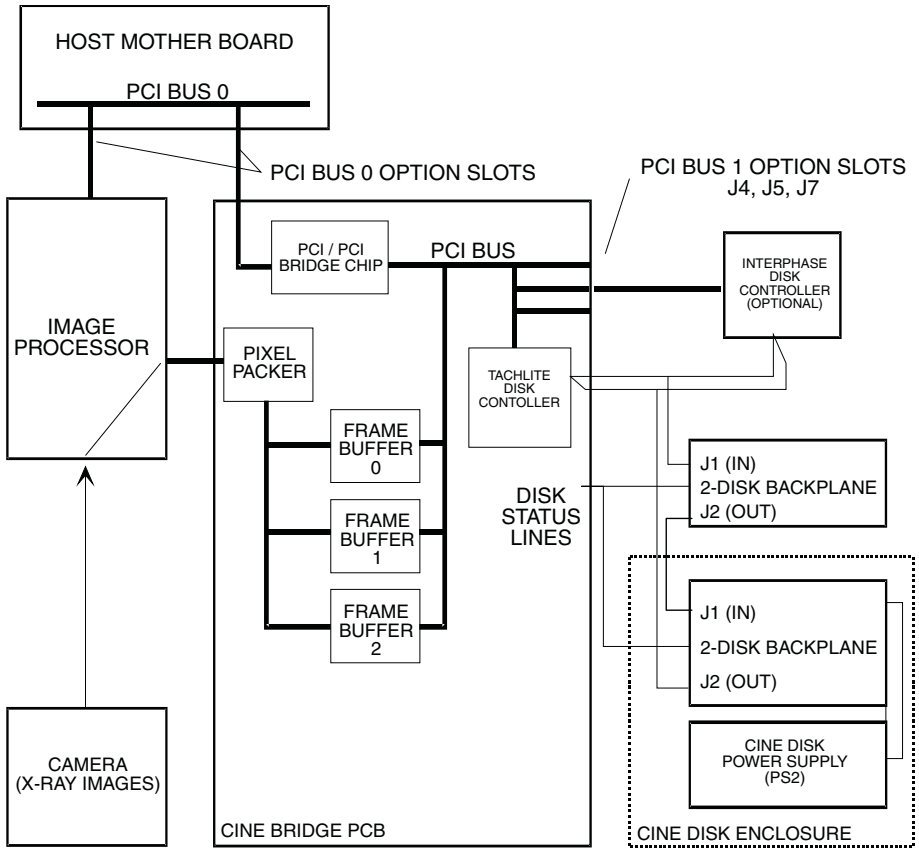
References

Refer to **Cine Bridge PCB Schematic 00-880921-01** and to the following block diagram when reading this section.



Cine Disk Subsystem Block Diagram

Cine Bridge PCB

The Cine Bridge is the interface between the Image Processor PCB and the Cine Disk Drives. The Cine Bridge PCB controls the data flow via commands from the host processor.

During a data storage operation, digital image information is passed from the Image Processor PCB to the Cine Bridge PCB through a dedicated connection. The image data from the Image Processor is packed into a format suitable for disk storage and placed into memory buffers. The memory buffers are accessible by the Tachlite Disk Controller through a PCI Bus port.

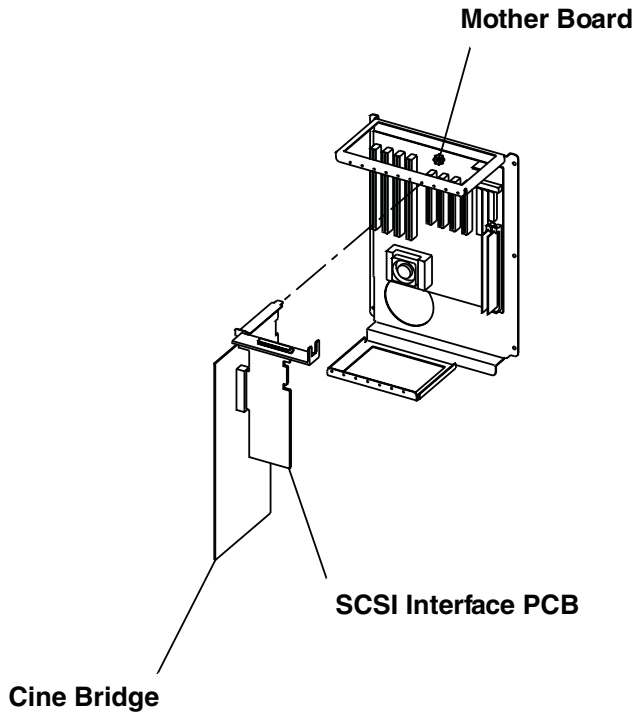
During data retrieval operation, packed data from the Tachlite Disk Controller is written into the memory buffer through a PCI Bus port. These memory buffers are then unpacked and presented to the Image Processor in the original digital image format through the dedicated connection.

In addition to the data flow interface, the Cine Bridge PCB contains two separate PCI Buses that are separated by a PCI to PCI Bridge. The PCI to PCI Bridge is intended to separate the host processor's PCI Bus (PCI Bus 0) from the second PCI Bus (PCI Bus 1) that is dedicated to the high data transfer rates between the memory buffers and the Tachlite Disk Controller.

The Cine Bridge PCB also has a spare Command Memory accessible to the PCI Bus. And a PCI Bus accessible port that provides information concerning the disks installed in the disk array.

Location

The Cine Bridge PCB connects directly to the host PCI Bus (PCI Bus 0) as shown in the following illustration.



Location of Cine Bridge PCB in Workstation.

Circuit Description

The primary purpose of the Cine Bridge PCB is to send and receive images to and from the Image Processor PCB. The Cine Bridge PCB uses the PCI Bus as a transmission medium for image data. The Cine Bridge is responsible for preparing the image data for access by the PCI Bus. Preparation is done through a set of image buffers that appears as memory accessible to the PCI Bus.

The secondary purpose of the Cine Bridge PCB is to provide a bridge to the host's PCI Bus. This allows the use of a PCI Bus dedicated to the transmission of image data to the Tachlite Disk Controller. The isolation of a secondary PCI Bus from the host PCI Bus is important to prevent the host bus arbitration functions from breaking up the long bursts required for the high data rate transfers. The secondary PCI Bus also extends the number PCI devices that can be in operation on the Workstation system.

***Note**: It is important not to install any PCI card into the secondary PCI Bus that will interfere with data transfer performance.*

The Cine Bridge PCB also assists operation of the Tachlite Disk Controller by providing a PCI accessible memory and cine drive monitoring. The memory functions as a temporary buffer for command data to the Tachlite Disk Controller. The device monitoring functions permits host applications to determine the status of the Cine drives.

Test Points

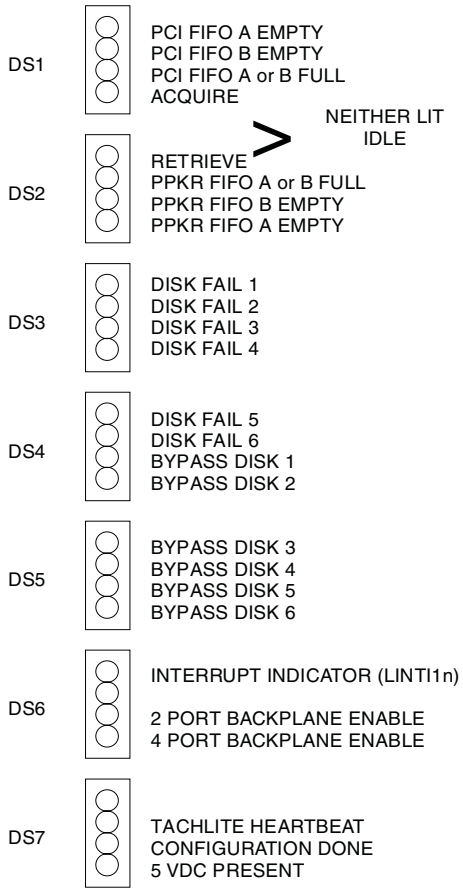
There are no useful test points on the Cine Bridge PCB.

Circuit Breakers and Fuses

There are no circuit breakers or fuses on the Cine Bridge PCB.

Troubleshooting

LEDs on the Cine Bridge PCB monitor its status. Please refer to the following illustration for details.



Cine Bridge PCB Status LEDs

The RUT (Remote Utilities Tool) can be used to check the communications of the Fibre Channel cables. If a cine prepare can be successfully accomplished, the Fibre Channel communications are good. Additionally, you can use RUT to test the cine disk data throughput after a cine prepare has been performed. If one cine disk is bad, the disk transfer rate will be below the required rate.

***Note**: Refer to the on-line help supplied with RUT for detailed instructions on how to check the fibre channel cables.*

***Note**: If communication with the cine drives fails, make sure the Fibre Channel cables are not reversed where they connect to the 2-Disk or 4-Disk Backplanes. Reversal of the Fibre Channel cables does not damage circuitry, but communications with the drives does not work.*

You also can use the green LED indicators on the Cine Bridge PCB to check communications with the cine drives at boot-up. If the LEDs do not flicker, there is a good chance that the Fibre Channel cables are either installed backwards or they have failed. Also be sure that power is connected to the 2-Disk or 4-Disk Backplanes. If the cables are installed correctly and the power is OK, there is a good chance that the Cine Bridge PCB has failed.

Removal and Replacement

1. Turn off the power to the Workstation.
2. Remove the SCSI Interface PCB from the Cine Bridge PCB by removing the 6-32-3/8-inch screw located on top of the PCB.
3. Disconnect the PCB from the port.
4. Remove the two 6-32-3/8-inch screws that hold the board to the card rack. One screw is on the top and one screw is on the bottom of the board.
5. Grip the board and pull outward until it is clear from the card rack.
6. Disconnect the SCSI Interface card rack from the Cine Bridge PCB.

Perform the steps in reverse order to install a new Cine Bridge PCB.

Cine 2-Disk and Cine 4-Disk Backplanes

The following paragraphs describe the cine disk backplanes.

Location

The Cine 2-Disk backplane is located inside the Electronics box on the lower right hand side behind the Cine Hard Disk(s), attached to a bracket.

The Cine 4-Disk backplane is located outside the Electronics box in its own chassis. It is in the front area of the Workstation where the Lenzar is installed.

Circuit Description

The backplanes provide power to each Cine disk drive. Power to each disk drive goes through the same disk drive connector as data (unlike standard disk drives where power is applied through a separate connector). Each backplane also has a looping input and output FC-AL connector for serial input and serial output data.

The disk drives are essentially SCSI disk drives with one difference; rather than transferring SCSI commands/data via a standard SCSI parallel ribbon cable, commands and data are packetized and placed on the Fibre Channel Arbitrated Loop (FC-AL). The drives contain circuitry that packetized/unpacketized the data and commands. Commands are re-generated into the original SCSI command.

The FC-AL (Loop) is designed so that up to 6 drives can be installed without the need for disk configuration or jumper selection.

Due to the “looping” architecture of FC-AL, a break anywhere in the loop causes the entire loop to fail. To enable the backplane to be short-stuffed (for example, with three drives instead of four), each drive has a corresponding “Loop Resiliency Circuit” or LRC. The LRC allows the high-speed data to bypass the missing disk drive.

Each disk drive contains detection circuitry to determine if the drive is capable of placing itself in the loop. If a drive determines it is operating properly, the drive waits for an “idle” on the loop and then places itself in the loop. Each drive provides an output signal called “BYPASS” that controls its corresponding LRC.

In addition to the BYPASS output signal, each drive provides a FAIL output signal. Some important differences exist between the BYPASS and FAIL signals. Each disk drive contains two logical hardware sections – a SCSI-3 disk drive section and the FC-AL section. A FC-AL disk drive is actually a SCSI-3 disk drive with a high-speed Fibre Channel serial loop attached rather than the parallel SCSI bus. The SCSI portion of the hardware generates the FAIL output signal. The FC-AL portion generates the BYPASS output signal.

If a drive fails but is still capable of placing itself in the loop, it will place itself in the loop so software diagnostics can be run. On the other hand, if a failure is detected in the high-speed FC-AL section, the drive will take itself off the loop (or never put itself on the loop) by forcing BYPASS low.

The status of the entire cine disk array is obtainable by reading the state of the six BYPASS status lines and six FAIL status lines (P4). Additionally, the 4-Disk Backplane provides a “4-disk installed” status line that can be used to determine if the 4-Disk Backplane is in the loop. The 2-Disk Backplane provides its own 2-disk installed status signal. Software has the ability to determine which backplanes are in the loop.

To check this status, look at the Cine Bridge PCB LEDs.

Test Points

There are no useful test points on the Cine Disk Backplanes.

Circuit Breakers and Fuses

There are no circuit breakers or fuses on the Cine Disk Backplanes.

Troubleshooting

A failure of the 4-Disk Backplane that prevents data from transmitting around the loop renders the entire Cine Disk Subsystem unusable. Whether the loop breaks due to a Cine Power Supply failure, component failure in the loop itself or Fibre Channel cable failure, the result is the same.

If the fault is in the 4-Disk Backplane, replace the backplane.

***Note**: A loop failure does not prevent the 9800 System from being used to take and display live X-ray images. The images simply cannot be recorded or played back using the Cine Subsystem.*

Removal and Replacement

Use the following procedure to remove and replace the 2-Disk Backplane.

1. Remove the four 6-32x3/8-inch Torx Pan Head screws that secure the Hard Drives to the Hard Drive bracket.
2. Remove the two Cine disk hard drives.
3. Remove the six 6-32x3/8-inch Torx Pan Head Screws from the Hard Drive Mount bracket.
4. Remove the 2-Disk Backplane from the Hard Drive bracket.

Reverse the steps above to install a new backplane.

Use the following procedure to remove and replace the 4-Disk Backplane.

1. Remove the front and left side panels. (As you look at the Workstation from the front.)
2. Remove two 8-32x3/8-inch Torx Pan Head screws that hold the Cine Drive mount up in the vertical position.
3. Bring down the Cine Drive mount bracket to the horizontal position. It will be held in position with a Lanyard cable.
4. Remove all sixteen 6-32x3/8-inch Torx Pan Head screws from all four Cine Drives.
5. Remove all four Cine Drives from the 4-Disk Backplane.
6. Remove the eight 6-32x3/8-inch Torx Pan Head screws from the 4-Disk Cine Backplane.
7. Remove the 4-Disk Backplane from the Drive Bracket.

Reverse the steps above to install a new backplane.